General

Title

Sepsis: proportion of hospitals with a specific written protocol to identify and treat children with sepsis syndrome in the ED.

Source(s)

Quality Measurement, Evaluation, Testing, Review, and Implementation Consortium (Q-METRIC). Basic measure information: protocol for identifying and treating children with sepsis syndrome in the emergency department. Ann Arbor (MI): Quality Measurement, Evaluation, Testing, Review, and Implementation Consortium; 2014 Aug. 42 p.

Measure Domain

Primary Measure Domain

Clinical Quality Measures: Structure

Secondary Measure Domain

Does not apply to this measure

Brief Abstract

Description

This measure is used to assess the proportion of hospitals with a specific written protocol to identify and treat children with sepsis syndrome in the emergency department (ED).

Rationale

Sepsis is a potentially catastrophic condition that can escalate from infection to organ failure and death within hours. While mortality rates for pediatric sepsis have decreased over time, 4% to 10% of hospitalized children with sepsis in the United States die (Watson et al., 2003; Odetola, Gebremariam, & Freed, 2007). Also, annual hospital treatment costs are significant, at nearly $2 billion (Watson et al., 2003). Clinical practice parameters and clinical guidelines for the treatment of children with sepsis syndrome emphasize the critical importance of early recognition and aggressive treatment for all suspected cases (Dellinger et al., 2013; Carcillo et al., 2002). Improved survival has been associated with

adherence to guidelines that emphasize timeâ€sensitive resuscitation of children with sepsis syndrome (Han et al., 2003). Whether a child presents to an academic medical center or to a community hospital, clinicians must be ready to rapidly deploy a set of timeâ€sensitive, goalâ€directed, stepwise procedures to hinder or reverse the cascade of events in sepsis that lead to organ failure and death.

One fundamental element of timely and appropriate treatment is a sepsis management protocol. Based on clinical guidelines and research-driven data, instructions within the protocol provide a set of consistent steps to help clinicians in the emergency department (ED) recognize sepsis syndrome in pediatric patients and promptly initiate evidence-based interventions, such as fluid resuscitation and antibiotics, likely to hinder the occurrence of, or reverse progression to, septic shock. Protocols support immediate, consistent, and appropriate treatment, regardless of care setting. They also help institutions centralize resources for very sick patients, foster acceptable levels of competence for the skills necessary to provide successful treatment, and produce uniform data amenable to useful comparison and analysis (Dellinger et al., 2013; Rivers & Ahrens, 2008; Cruz et al., 2011; Larsen, Mecham, & Greenberg, 2011). Despite the clear value of such protocols, however, many hospitals lack them, undermining the ability of ED staff to quickly identify and effectively treat children with sepsis syndrome.

Evidence for Rationale

Carcillo JA, Fields AI. Clinical practice parameters for hemodynamic support of pediatric and neonatal patients in septic shock. Crit Care Med. 2002 Jun;30(6):1365-78. [162 references] PubMed

Cruz AT, Perry AM, Williams EA, Graf JM, Wuestner ER, Patel B. Implementation of goal-directed therapy for children with suspected sepsis in the emergency department. Pediatrics. 2011 Mar;127(3):e758-66. PubMed

Dellinger RP, Levy MM, Rhodes A, Annane D, Gerlach H, Opal SM, Sevransky JE, Sprung CL, Douglas IS, Jaeschke R, Osborn TM, Nunnally ME, Townsend SR, Reinhart K, Kleinpell RM, Angus DC, Deutschman CS, Machado FR, Rubenfeld GD, Webb SA, Beale RJ, Vincent JL, Moreno R, Surviving Sepsis Campaign Guidelines Committee including the Pediatric Subgroup. Surviving sepsis campaign: international guidelines for management of severe sepsis and septic shock: 2012. Crit Care Med. 2013 Feb;41(2):580-637. [636 references] PubMed

Han YY, Carcillo JA, Dragotta MA, Bills DM, Watson RS, Westerman ME, Orr RA. Early reversal of pediatric-neonatal septic shock by community physicians is associated with improved outcome. Pediatrics. 2003 Oct;112(4):793-9. PubMed

Larsen GY, Mecham N, Greenberg R. An emergency department septic shock protocol and care guideline for children initiated at triage. Pediatrics. 2011 Jun;127(6):e1585-92. PubMed

Odetola FO, Gebremariam A, Freed GL. Patient and hospital correlates of clinical outcomes and resource utilization in severe pediatric sepsis. Pediatrics. 2007 Mar;119(3):487-94. PubMed

Quality Measurement, Evaluation, Testing, Review, and Implementation Consortium (Q-METRIC). Basic measure information: protocol for identifying and treating children with sepsis syndrome in the emergency department. Ann Arbor (MI): Quality Measurement, Evaluation, Testing, Review, and Implementation Consortium; 2014 Aug. 42 p.

Rivers EP, Ahrens T. Improving outcomes for severe sepsis and septic shock: tools for early identification of at-risk patients and treatment protocol implementation. Crit Care Clin. 2008 Jul;24(3 Suppl):S1-47. PubMed

Watson RS, Carcillo JA, Linde-Zwirble WT, Clermont G, Lidicker J, Angus DC. The epidemiology of severe sepsis in children in the United States. Am J Respir Crit Care Med. 2003 Mar 1;167(5):695-701.

PubMed

Primary Health Components

Sepsis syndrome; written protocol; emergency department (ED); identification; treatment; children

Denominator Description

The eligible population for the denominator is all hospitals with an emergency department (ED).

Numerator Description

The numerator represents the number of hospitals with a specific written protocol to identify and treat children with sepsis syndrome in the emergency department (ED) (see the related "Numerator Inclusions/Exclusions" field).

Evidence Supporting the Measure

Type of Evidence Supporting the Criterion of Quality for the Measure

A clinical practice guideline or other peer-reviewed synthesis of the clinical research evidence

A formal consensus procedure, involving experts in relevant clinical, methodological, public health and organizational sciences

A systematic review of the clinical research literature (e.g., Cochrane Review)

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

Additional Information Supporting Need for the Measure

Sepsis Prevalence and Incidence
While sepsis-associated mortality in children has declined in recent years, from 97% in infants in 1966 to 9% in the early 1990s, it remains a major cause of morbidity and mortality among children (Watson et al., 2003). Incidence of pediatric sepsis was estimated in 1995 to be 0.56/1000 children, with the highest prevalence in infancy at 5.6/1000 children; boys had a higher incidence compared with girls (0.6 vs. 0.52 per 1000 children) (Watson et al., 2003). Sepsis prevalence tends to have two peaks during childhood, corresponding to significant periods of time in the maturity of the immune system: first, during the neonatal stage, with an incidence of 4.3 per 1000 and second, at 2 years of age (Watson et al., 2003). Odetola et al. (2007) reported another ageâ€specific peak in hospitalization rates: in 2003, children 15 to 19 years of age made up 18% of the pediatric population hospitalized nationally for sepsis.

Mortality among hospitalized children with severe sepsis has been reported to be between 4% and 10% (Watson et al., 2003; Odetola, Gebremariam, & Freed, 2007). Mortality is strongly associated with multiple organ dysfunction syndrome, occurring in 7% of children with one failing organ, increasing to 53% in those with at least four failing organs (Watson et al., 2003). Comorbid illness is also associated with mortality from sepsis, with mortality rates of 8% in children with comorbid illness versus 2% among previously healthy children (Odetola, Gebremariam, & Freed, 2007). There are also reports of ageâ€specific differences in mortality from pediatric sepsis. Higher mortality rates among children over the age of 2 years may be attributable to the presence of chronic and severe underlying disease and to improved survival of immuneâ€compromised and immuneâ€suppressed children (Oliveira et al., 2008).

Also, older pediatric patients have been sick longer than younger patients and may also have experienced more hospital admissions and treatments, such as transplantation or chemotherapy, making them more vulnerable to sepsis syndrome (Oliveira et al., 2008).

Sepsis Cost

Estimated annual total cost of pediatric sepsis in the United States is $1.97 billion (Watson et al., 2003). The average (mean) charge per hospitalization for sepsis is $47,126 (Odetola, Gebremariam, & Freed, 2007). Children who died from sepsis had total hospital charges that were 2.5-fold higher compared with those who survived. Higher charges were also associated with higher severity of illness. Longer length of stay for children hospitalized with sepsis was associated with multiple comorbidities, multiple organ dysfunction, and higher illness severity (Odetola, Gebremariam, & Freed, 2007).

Performance Gap

Despite the availability of evidenceâ€based guidelines for the care of children with sepsis, only a minority of children receive the standard of care. Process barriers are a common problem leading to delays in the recognition and treatment of pediatric shock (Cruz et al., 2011). They include varying levels of experience among emergency department (ED) staff performing initial evaluations, lack of adequate nursing staff for resourceâ€intensive patients, difficulty in obtaining frequent vital signs, lack of standardization of empiric antibiotics and diagnostic tests, lack of prioritization of medications, and barriers to patient flow through the hospital (Cruz et al., 2011). Similarly, Oliveria et al. (2008) suggested reasons for delay may include inaccuracy in assessing the severity of a child's state of shock, shortage of health care providers, fatigue among medical teams, and difficulty in establishing adequate intravascular access. Rivers and Ahrens (2008) describe several potential impediments to implementing a sepsis protocol, including professional barriers, such as lack (or variation) of expertise and resistance to change; institutional barriers, such as departmental competition and limited staff; and physical barriers, such as lack of equipment or space. They opined that identification of one or more knowledgeable leaders with the resources and authority needed to address such barriers is essential to successfully advocate for a sepsis protocol initiative and to promote an atmosphere of teamwork and quality care.

As severe sepsis and septic shock are timeâ€sensitive conditions that demand immediate care, the timing and location of treatment are important considerations. Treatment cannot start upon arrival at the intensive care unit (ICU); it must begin when patients present to the ED (Larsen, Mecham, & Greenberg, 2011). Early recognition and treatment of severe sepsis and septic shock right from presentation in the ED benefits all patients because it leads to more meticulous patient assessment (Larsen, Mecham, & Greenberg, 2011). Implementation of sepsis protocols before transfer to the ICU should greatly improve outcomes for patients with severe sepsis (Rivers & Ahrens, 2008).

Given the nature of ED care, patients may wait several hours before being evaluated by a physician. A sepsis protocol in the ED offers a process by which to identify patients at risk for septic shock who present at triage or whose course worsens while at they are in the ED. The goal of the protocol is earlier physician evaluation; it also helps provide nursing staff with guidelines to initiate timely care (Larsen, Mecham, & Greenberg, 2011).

Another possible performance barrier relates to hospital type and location. Many children live far from medical facilities that offer specialized pediatric care. For those presenting with septic shock to remote community hospitals, treatment efforts made by the physicians are crucial to their survival and should be prioritized. Delay in care while waiting to transfer patients to a more advanced pediatric medical facility is unwise (Han et al., 2003). Han et al. (2003), in a 9 year retrospective study, reported that 29% of infants and children who presented with septic shock at community hospitals and required transport to a larger medical center did not survive. In a separate report, Odetola et al. (2007) reported that pediatric patients with sepsis who were transferred incurred higher charges than those whose care did not entail transfer. The presence of an ED protocol at community hospitals that supports immediate treatment could be life-saving.

As clinical guidelines for the treatment of sepsis were developed at pediatric academic centers without accounting for use at community hospitals, barriers to their use may exist (Han et al., 2003). For example, some community physicians may lack specialized technical skills involved in managing severe

sepsis or septic shock. Educational barriers regarding the guidelines themselves may curtail implementation, if physicians are unaware of, or lack support to execute, stepwise, goalâ€directed interventions in a timely manner. However, most of the procedures detailed in current guidelines are easily within the scope of a communityâ€based practice (Han et al., 2003). Continued efforts to increase knowledge and comfort with sepsis guidelines among community physicians will likely improve outcomes. Odetola and colleagues (2007) also noted an urgent need for concerted clinical and educational efforts within the clinical care setting designed to limit the progression of sepsis severity, as multiple organ dysfunction portends poor outcomes including death.

See the original measure documentation for additional evidence supporting the measure.

Evidence for Additional Information Supporting Need for the Measure

Cruz AT, Perry AM, Williams EA, Graf JM, Wuestner ER, Patel B. Implementation of goal-directed therapy for children with suspected sepsis in the emergency department. Pediatrics. 2011 Mar;127(3):e758-66. PubMed

Han YY, Carcillo JA, Dragotta MA, Bills DM, Watson RS, Westerman ME, Orr RA. Early reversal of pediatric-neonatal septic shock by community physicians is associated with improved outcome. Pediatrics. 2003 Oct;112(4):793-9. PubMed

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Odetola FO, Gebremariam A, Freed GL. Patient and hospital correlates of clinical outcomes and resource utilization in severe pediatric sepsis. Pediatrics. 2007 Mar;119(3):487-94. PubMed

Oliveira CF, Nogueira de SÃi FR, Oliveira DS, Gottschald AF, Moura JD, Shibata AR, Troster EJ, Vaz FA, Carcillo JA. Time- and fluid-sensitive resuscitation for hemodynamic support of children in septic shock: barriers to the implementation of the American College of Critical Care Medicine/Pediatric Advanced Life Support Guidelines in a pediatric intensive care unit in a developing world. Pediatr Emerg Care. 2008 Dec;24(12):810-5. PubMed

Quality Measurement, Evaluation, Testing, Review, and Implementation Consortium (Q-METRIC). Basic measure information: protocol for identifying and treating children with sepsis syndrome in the emergency department. Ann Arbor (MI): Quality Measurement, Evaluation, Testing, Review, and Implementation Consortium; 2014 Aug. 42 p.

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Extent of Measure Testing

Reliability

Data and Methods. Testing data consisted of results from a telephone survey of nurse managers and physician directors at 50 randomly selected hospitals with emergency departments (EDs) in the states of Michigan and Ohio. Respondents were asked if their ED had a protocol for identifying and treating children with sepsis syndrome.

Validity
The validity of this measure was determined from two perspectives: face validity and validity of the facility survey data.

Face Validity. The validity of this measure was determined from face validity, the degree to which the measure construct characterizes the concept being assessed. The face validity of this measure was established by a national panel of experts and a parent representative for families of children with sepsis syndrome convened by the Quality Measurement, Evaluation, Testing, Review, and Implementation Consortium (Q-METRIC). The Q-METRIC panel included nationally recognized experts in the identification and treatment of pediatric sepsis syndrome, representing neonatology, hematology/oncology, infectious diseases, emergency medicine, nursing, pediatric surgery, and pediatric intensive care. In addition, measure validity was considered by experts in state Medicaid program operations, health plan quality measurement, health informatics, and health care quality measurement. In total, the Q-METRIC sepsis panel included 15 experts, providing a comprehensive perspective on sepsis syndrome care and the measurement of quality metrics for states and health plans.

The Q-METRIC expert panel concluded that this measure has a high degree of face validity through a detailed review of concepts and metrics considered to be essential to effective sepsis syndrome identification and treatment. Concepts and draft measures were rated by this group for their relative importance. This measure was highly rated, receiving an average score of 6.9 (with 9 as the highest possible score).

Validity of Abstracted Data. This measure was tested using facility survey data. Fifty hospitals were randomly selected in the states of Michigan and Ohio (Table 4 of the original measure documentation). After several calls (range of 1 to 6, based on response), 27 hospital ED nurse managers or physician directors responded. Eleven of the 27 (41%) reported having a written protocol for the identification and treatment of children who present to the ED with sepsis syndrome (Table 5 â€‹of the original measure documentation). Sixteen facilities (59%) indicated that they did not have a protocol.

Validity of the data obtained through the telephone survey was to be assessed through verification of the existence of a protocol. Sites indicating that they had a sepsis protocol were asked to submit this protocol to the study team. The team was interested in verifying the existence of a protocol, not assessing the content of the protocols. Of those respondents who indicated they had a protocol (n=11), only two protocols were received (18%) despite multiple messages to the respondents. Some protocols could not be sent because they were incorporated into the electronic health records in the hospitals.

Evidence for Extent of Measure Testing

Quality Measurement, Evaluation, Testing, Review, and Implementation Consortium (Q-METRIC). Basic measure information: protocol for identifying and treating children with sepsis syndrome in the emergency department. Ann Arbor (MI): Quality Measurement, Evaluation, Testing, Review, and Implementation Consortium; 2014 Aug. 42 p.

State of Use of the Measure

State of Use

Current routine use

Current Use

not defined yet

Application of the Measure in its Current Use

Measurement Setting

Emergency Department

Hospital Outpatient

Professionals Involved in Delivery of Health Services

not defined yet

Least Aggregated Level of Services Delivery Addressed

Single Health Care Delivery or Public Health Organizations

Statement of Acceptable Minimum Sample Size

Does not apply to this measure

Target Population Age

Does not apply to this measure

Target Population Gender

Does not apply to this measure

National Strategy for Quality Improvement in Health Care

National Quality Strategy Aim

Better Care

National Quality Strategy Priority

Institute of Medicine (IOM) National Health Care Quality Report Categories

IOM Care Need

Not within an IOM Care Need

IOM Domain

Not within an IOM Domain

Data Collection for the Measure

Case Finding Period

Unspecified

Denominator Sampling Frame

Health care or public health organization

Denominator (Index) Event or Characteristic

Health Care/Public Health Organization Characteristic

Denominator Time Window

not defined yet

Denominator Inclusions/Exclusions

Inclusions
The eligible population for the denominator is all hospitals with an emergency department (ED).

Exclusions
None

Exclusions/Exceptions

not defined yet

Numerator Inclusions/Exclusions

Inclusions
The numerator represents the number of hospitals with a specific written protocol to identify and treat children with sepsis syndrome in the emergency department (ED).

Note:

> *Written Protocol*: A paper or electronic protocol with any mention of "sepsis" AND any mention of "children" or individuals younger than 19 years of age
> *Sepsis Syndrome*: Sepsis, severe sepsis or septic shock (refer to Table 1 of the original measure documentation)
> International Classification of Diseases, Ninth Revision (ICD-9) codes to identify sepsis syndrome diagnoses are documented in Table 2 of the original measure documentation.

Exclusions
None

Numerator Search Strategy

Fixed time period or point in time

Data Source

Health professional survey

Type of Health State

Does not apply to this measure

Instruments Used and/or Associated with the Measure

Unspecified

Computation of the Measure

Measure Specifies Disaggregation

Does not apply to this measure

Scoring

Rate/Proportion

Interpretation of Score

Desired value is a higher score

Allowance for Patient or Population Factors

not defined yet

Standard of Comparison

not defined yet

Identifying Information

Original Title

Protocol for identifying and treating children with sepsis syndrome in the emergency department.

Measure Collection Name

Sepsis Measures

Submitter

Quality Measurement, Evaluation, Testing, Review, and Implementation Consortium (Q-METRIC) - Academic Affiliated Research Institute

Developer

Quality Measurement, Evaluation, Testing, Review, and Implementation Consortium (Q-METRIC) - Academic Affiliated Research Institute

Funding Source(s)

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Composition of the Group that Developed the Measure

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Financial Disclosures/Other Potential Conflicts of Interest

Unspecified

Adaptation

This measure was not adapted from another source.

Date of Most Current Version in NQMC

2014 Aug

Measure Maintenance

Unspecified

Date of Next Anticipated Revision

Unspecified

Measure Status

This is the current release of the measure.

The measure developer reaffirmed the currency of this measure in January 2016.

Measure Availability

Source available from the Quality Measurement, Evaluation, Testing, Review, and Implementation Consortium (Q-METRIC) Web site. Support documents are also available.

For more information, contact Q-METRIC at 300 North Ingalls Street, Room 6C08, SPC 5456, Ann Arbor, MI 48109-5456; Phone: 734-232-0657; Fax: 734-764-2599.

NQMC Status

This NQMC summary was completed by ECRI Institute on April 16, 2015. The information was verified by the measure developer on May 19, 2015.

The information was reaffirmed by the measure developer on January 7, 2016.

Copyright Statement

Production

Source(s)

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